

FIELD GUIDE TO THE AMPHIBIANS OF WESTERN INDIA¹

PART 4

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 (Continued from Vol. 72 (2): 522)
 (With six text-figures and two plates)

Part 3 of this serial described frogs of the subgenera *Rana* and *Tomopterna* of the genus *Rana*. In this section we describe species of the subgenera *Discodeles* and *Hylorana* of the Family Ranidae and tree frogs of the family Rhacophoridae.

Subgenus *Discodeles*

Tips of fingers and toes dilated into discs. Tongue with a large retractile papilla in the middle (Fig. 1 a.) In western Ghats six species are available and those can be separated by the following key.

KEY TO THE SPECIES OF *Rana* (*Discodeles*) IN WESTERN INDIA

1. Toes 1/2 to 2/3 webbed (see fig. 2 c & d)..... 2
1. Toes not more than 1/4 webbed (see fig. 2b)..... 3
2. First finger shorter than second; tympanum 2/3 diameter of the eye *leithii*
2. First finger at least as long as second; tympanum 1/2 to 2/3 diameter of the eye..... *beddomii*
2. First finger longer than second; tympanum as large as eye and close to it *semipalmata*
3. Tympanum very distinct; loreal region very oblique; skin of head smooth, of back with short longitudinal folds; no lumbar spot..... *leptodactyla*
3. Tympanum distinct; loreal region feebly oblique; skin of head smooth; of back with short longitudinal folds; a black lumbar spot *diplosticta*
3. Tympanum moderately distinct; head and back with large warts *phrynoderma*

¹Accepted February 1989.

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³ABDULALI, H. & DANIEL, J.C. (1954): Distribution of *Rana leithii* Boulenger - A correction. *J. Bombay nat. Hist. Soc.* 52: 635.

⁴DANIEL, J.C. & SHULL, E.M. (1964): A list of the Reptiles and Amphibians of the Surat Dangs, South Gujarat. *J. Bombay nat. Hist. Soc.* 60: 737-743.

⁵MCCANN, C. (1932): Notes on Indian Batrachians. *ibid.* 32: 152-180

Rana leithii Boulenger, 1888: Leith's Frog

Diagnosis: Small sized frogs; largest specimen in the BNHS collection measured 38 mm. The bifid tongue has a distinct papilla, Head moderate; snout obtuse. Interorbital width a little narrower than the upper eyelid; tympanum 2/3 the diameter of the eye. First finger not extending quite as far as second; toes 2/3 webbed. Tips of fingers and toes dilated into small discs with circum-marginal groove. Tibio tarsal articulation reaching between the eye and the tip of the snout; inner metatarsal tubercle oval; no tarsal fold. The heels overlap when the limbs are folded at right angles to the body.

Skin of back with small scattered longitudinal warts; a strong fold from the eye to the shoulder.

Colour: Brown above with small dark spots; limbs with dark transverse bands, lower parts white; throat mottled with brown. Specimens seen in Matheran by Abdulali and Daniel (1954)³ showed variation some being dark grey, blackish or paler and some with golden patches.

Distribution: Occurs along the Western Ghats from Surat Dangs, Gujarat in the north, southward to Central Kerala.

Breeding: The breeding season coincides with SW monsoon. Specimens collected in June from Matheran and Kanheri caves had well developed gonads. Tadpoles were collected at hill-streams on rocks wetted by spray. Very active and agile jumping several centimetres on the slippery surfaces. The coloration matches so well the dark grey of the rocks that it is very difficult to distinguish them (Daniel and Shull 1964)⁴. They attain 44.0 mm in total length. Tail 2.5 times the length of body. Dental formula is 1:3+3/2+2:2.

Habits: The species is found at moderate elevation and lives under stones and among ground litter during the day. McCann (1932)⁵ noted that the frog was not uncommon in short grass and in ditches on

hill sides and appears to be diurnal, at least during the rains. It was frequently seen hopping about in the grass.

Rana beddomii (Gunther, 1875), Beddome's
Frog

Diagnosis: Medium sized frogs, the largest specimen in the *BNHS* collection has a snout to vent length of 50 mm. This species closely resembles *Rana leithii* but can be separated by the following characters: Inter orbital space as broad as the upper eyelid. Fingers moderate. First at least as long as second. The tibio-tarsal articulation reaches the tip of the snout or a little beyond. The heels strongly overlap when the limbs are folded at right angles to the body.

Skin of back with short longitudinal glandular folds; a strong fold (supra tympanic fold) from the eye to the shoulder.

Colour: Brown above with rather indistinct darker spots rarely uniform pinkish; sometimes a light vertebral band; a dark cross band between the eyes; a black band along the canthus rostralis and a black temporal spot; limbs more or less distinctly cross-barred; lower parts uniform white.

Distribution: Specimens in *BNHS* collection from North Kanara, Talewadi in Karnataka; Munnar, Alwaye Ghat, Periyar lake, South Travancore in Kerala; Palni Hills, Courtalum in Tamil Nadu.

Breeding: Males without vocal sacs with an enlarged pad on the inner side of the first finger. Specimens collected between December and June have mature gonads. Tadpole remarkable for its long tail, 3 times the length of the body (Boulenger, 1920)⁶ Tadpoles collected from rock faces made short, skittering jumps across the rock faces whenever they were closely approached. The principal function of this behaviour is to enable the tadpoles to move from one tiny, shallow pool to another

across slightly drier surface irregularities of the home rock face. Dental formula is $4 + 4/2 + 2:2$ (Inger *et al.* 1984)⁷.

Habits: Little known. The species is extremely common and lives under rocks in flowing streams, many of which held a luxuriant growth of *Ammania floribunda*. In the field it appears very like *R. leithii* (common at Panchgani, 1400 m), but *R. beddomii* keeps more to the wet rocks and flowing water than *leithii*, which is often found in grass at the top of hills or alongside hill streams. Frequently seen during the day but more abundant at night (Abdulali & Daniel 1954)⁸. Inger *et al.* (op. cit.) collected the specimens from different types of forest, banks of permanent streams, dry stream beds, rocks, dead leaves etc.

Rana semipalmata Boulenger, 1882

Diagnosis: Small sized frogs measuring upto 28 mm in snout to vent (*BNHS* collection). Bifid tongue with a papilla in the middle. Head moderate; snout blunt. Inter orbital width as broad as the upper eyelid or a little narrower. Tympanum equal to the diameter of eye. First finger a little longer than the second; Toes half webbed; Tips of fingers and toes dilated into disks with circum-marginal groove. Subarticular tubercles well developed; a single small oval inner metatarsal tubercle; no tarsal fold. Tibio-tarsal articulation reaching the tip of the snout or between the eye and snout. The heels overlap when the limbs are folded at right angles to the body.

Skin of back with short longitudinal glandular folds; sides granulate with small warts, a strong glandular fold from the eye to the shoulder; lower parts smooth. Mature males have nuptial pads on the first finger and enlarged glands covering the ventral surface of the thighs.

Colour: Brown above, sides of body darker, loreal and temporal regions blackish, limbs with dark crossbars, lower parts white, throat and breast mottled with brown.

Distribution: Malabar and Anamalai hills, Kerala, South India. Specimens in *BNHS* collected from Pulloorampara, Calicut in Kerala and Poombarai, Kodaikanal in Tamil Nadu.

Breeding: Unknown.

Habits: This species is found in evergreen and

⁶BOULENGER, G.A. (1920): A monograph of the South Asian, Papuan, Melanesian and Australian frogs of the genus *Rana*. *Rec. Indian Mus.* 20: 1-226.

⁷INGER, R.F., SHAFFER, H.B., KOSHY, M. & BAKDE, R. (1984): A report on a collection of Amphibians and Reptiles from the Ponnudi, Kerala, South India.. *J. Bombay nat. Hist. Soc.* 81: 406-427, 551-570.

⁸ABDULALI, H. & DANIEL, J.C. (1954): Some notes on *Rana beddomii* Gunther with an extension of its range. *ibid.* 52:938.

moist deciduous forest upto 360 m elevation; specimens collected from small permanent streams, dead leaves and rocks (Inger *et al.*, 1984).

Rana leptodactyla Boulenger, 1882

Diagnosis: Small sized frogs; measuring upto 23 mm (male) in the *BNHS* collection. Tongue with papilla. Head depressed snout blunt. Interorbital width as broad as or little narrower than the upper eyelid. Tympanum 2/3 diameter of the eye. First finger shorter than second; toes 1/4 webbed. Tips of fingers and toes dilated into discs. Tibio-tarsal articulation reaching the tip of the snout or beyond. Heels overlap when the limbs are folded at right angles to the body.

Skin of the back with short longitudinal glandular folds; a fold from the eye to the shoulder.

Colour: Olive or brownish above, white uniform ventrally or spotted with brown, sometimes brown dotted with white.

Distribution: Forests of Malabar, Anamalais, Travancore (Kerala); Kodaikanal, Palni hills (Tamil Nadu) and Coorg (Karnataka).

Breeding: Specimens collected in April and May in Kodaikanal had well developed testes. Annandale (1918)⁹ collected the tadpoles in a small pool at the edge of a jungle stream in the hills in September. Tadpoles normal in shape. Total length was 31 mm. The mouth disc remarkably lacks horny teeth.

Habits: Unknown.

Rana diplosticta (Gunther, 1875)

Diagnosis: Closely resembles *Rana leptodactyla*, measures upto 25 mm (female). The canthus rostralis is rather more angular and the loreal region not quite so oblique. Toes less than 1/4 webbed; fingers and toes with large discs with strong circum-marginal groove. Tympanum well developed, about 1/2 of eye diameter. Males have a series of 5 very large, black, sharp nuptial spines on the medial surface of the first finger (Inger *et al.*, 1984).

Skin with a series of interrupted, longitudinal, glandular folds on the back. The head, sides and

⁹ANNANDALE, N. (1918): Some undescribed Tadpoles from the hills of South India, *Rec. Ind. Mus.* 15: 19.

belly are smooth. A strong curved supratympanic fold from eye to shoulder.

Colour: Reddish brown dorsally, with a black canthal and tympanic streak. Entire loreal region from canthus rostralis to upper lip is dark brown. Dark brown blotches may be present on the lateral surfaces. Ventrally light brown diffused with a fine reticulated pattern of dark brown. A black spot above the loin on each side. Limbs tan crossbarred with dark brown.

Distribution: Malabar, Kerala and forest of Srivilliputtur in Tamil Nadu.

Breeding: Unknown.

Habits: Inger *et al.* (1984.) collected the specimens at 950 m elevation, far from streams or ponds in ever green forest and gallery forest, under dead leaves, on bare soil and rock.

Rana phrynoderma Boulenger, 1882

This species occurs at Anamalai Hills measured 30 mm. Not available in the *BNHS* collection.

Subgenus *Hylorana*

Tips of toes or both fingers and toes dilated into discs, with circum-marginal groove (Fig. 1b). Tongue without a papilla; outer metatarsals usually separated by web to the base (Fig. 2e). Three species are described from western India.

KEY TO THE SPECIES OF *Rana* (*Hylorana*) OCCURRING IN WESTERN INDIA.

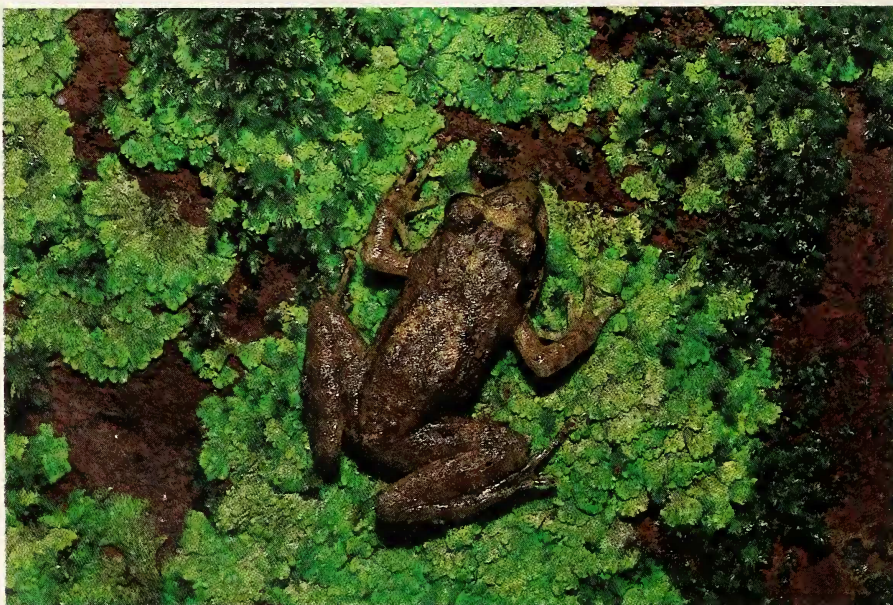
1. Discs of fingers, if present, without groove or the groove indistinct..... *curtipes*
1. Discs of fingers bearing a groove separating the upper from the lower surface 2
2. Tibio-tarsal articulation reaching between eye and the nostril (Fig. 3a)..... *aurantiaca*
2. Tibio-tarsal articulation reaching nostril or tip of snout, or a little beyond (Fig. 3b)..... *temporalis*

Rana curtipes Jerdon, 1853, Bicoloured Frog

Diagnosis: Medium sized frog. Adult in the *BNHS* collection 74 mm (female) in snout to vent length. Head depressed, snout obtusely pointed, canthus rostralis distinct. Loreal region concave. Interordi-



Rhacophorus malabaricus, Malabar Gliding Frog. (Photo: I. Kehimkar)



Above: *Polypedates maculatus*, Common Tree Frog (Photo: A. G. Sekar)
Below: *Rana leithi*, Leith's Frog (Photo: I. Kehimkar)

tal width broader than upper eyelid. Tips of fingers and toes swollen or dilated into discs with indistinct circum-marginal groove. First finger longer than second. Tibio-tarsal articulation reaches the tympanum or eye. Heels meet when the limbs are folded at right angles to the body; toes 3/4 or entirely webbed; inner metatarsal tubercle small; no tarsal fold. Males with internal vocal sacs with the fore limb more robust and a small patch of grey velvety rugosities on the inner metacarpal tubercle and on the inner side of the first finger.

Skin smooth; narrow, moderately prominent glandular dorsolateral fold; another fold behind the tympanum down to the shoulder.

Colour: The coloration is distinctive: grey above with or without black dots and black below. Both colours are sharply separated.

Distribution: Hills of North Canara (Karnataka), Malabar, and Travancore (Kerala). Specimens from Papanasam, Tirunelveli Dist., Tamil Nadu also seen in the *BNHS* collection.

Breeding: The frogs enter the water during the breeding season, which begins with southwest monsoon, Rao (1914)¹⁰ has reported that the males, which are smaller, are very lively and their call notes may be denoted by the short syllables 'Thrub, Thrub' quite characteristic of the species. The large sized tadpoles which move in shoals are plentiful in small jungle streams and occur in April, May & June. The tadpoles are distinctive, being black with a pinkish red well marked glandular patch behind the eye. The maximum total length is 94.0 mm. Dental formula is 2: 4 + 4/1 + 1:5. Enormous numbers of the metamorphosed young occur on the banks of the many inlets of the Periyar Lake in the summer months and are eaten by the Wild Boar (*Sus scrofa*) (V.S. Vijayan, *pers. comm.*)

Habits: It is not essentially aquatic; and is found under stones and dry vegetation on damp soil along streams. They are uncomfortable in water. According to Abdulali (1962)¹¹ the adults are sluggish in

their movements.

Rana temporalis (Gunther, 1864), Bronzed Frog

Diagnosis: Medium sized frog. Adult in the *BNHS* collection measured 82 mm (female) in snout to vent length. Head depressed; snout acute, projecting beyond the mouth; canthus rostralis angular; loreal region strongly concave. Interorbital width broader than upper eyelid. Tympanum very distinct 3/4 the diameter of the eye. Tips of fingers and toes dilated into well developed discs with distinct circum-marginal groove. First finger longer than second. Toes nearly entirely webbed; inner metatarsal tubercle small; no tarsal fold. Tibio-tarsal articulation reaches nostril or tip of snout or a little beyond.

The heels strongly overlap when the limbs are folded at right angles to the body. Males with internal vocal sacs with the fore limb strong and a large flat gland on the innerside of the arm; a strong pad on the innerside of the first finger, covered during the breeding season with a greyish brown velvet like horny layer.

Skin smooth; a prominent glandular dorso-lateral fold from above the tympanum to the hip. Lower parts smooth.

Colour: Yellowish brown to dark bronze above; limbs with dark brown cross bands; dorso-lateral fold usually with a dark outer edge; a dark brown, or black streak below the canthus rostralis continued on the temporal region, and some times on the side of the body. Lower parts white, uniform or spotted with brown on the throat and breast.

Distribution: Specimens in *BNHS* collection from Mahabaleshwar, (Maharashtra); Kaller base of Ponmudi Hill, Travancore (Kerala); Papanasam and Nilgiris at c 2000 m (Tamil Nadu).

Breeding: Specimens collected between October and December have well developed gonads. Abdulali (1954)¹² reported that there is some variation in the calls, but the commonest starts with a guttural croak followed by a series of 'tuk-tuk-tuks'. They call both day and night and are quite active during the day. He also observed the egg mass in a small pool in the course of the rock-strewn stream. The several masses of eggs were attached to the bottom or sides, all a few centimetres below water. Total

¹⁰RAO, C.R.N. (1914): Larva of *Rana curtipes*, Boul. Rec. Ind. Mus. 10: 265

¹¹ABDULALI, H. (1962): An account of a trip of the Barapede cave, Talewadi, belgaum District Mysore state with some notes on Reptiles and Amphibians. *J. Bombay nat. hist. Soc.* 59: 228-237.

¹²ABDULALI, H. (1954): Extension of Range of *Rana temporalis* Gunth. *J. Bombay nat. Hist. Soc.* 52: 636-637.

length of the tadpole was 33.8 mm. Dental formula is 1: 1 + 1/1 + 1:2. Head and body dark without distinct pattern dorsally and laterally; tail also dark, with small scattered black spots (Inger *et al*, 1984). **Habits:** The species is found on wet exposed rocks in small hill streams shaded by bushes. It leaps for a considerable distance into the water when disturbed. Very common during the day at the waterfall at Mahabaleshwar. A female frog contained 2 small frogs and a pebble in her stomach, while a male contained a *Rana limnocharis* (Abdulali 1962)¹¹.

Rana aurantiaca Boulenger, 1904 Golden Frog

Diagnosis: Small to medium sized frog; measuring 38 mm in snout to vent length. Slender. Snout long and narrow canthus rostralis distinct; loreal region vertical. Interorbital width very slightly broader than the upper eyelid. Tympanum distinct; 1/2 or 2/3 the diameter of the eye. Tips of fingers and toes dilated into discs with circum-marginal groove. Toes 2/3 webbed; Subarticular tubercles moderate; the outer matatarsal tubercle small and round whereas the inner elongated. Tibio-tarsal articulation reaches between eye and the nostril. Males have a darkly pigmented humeral gland close to the axilla and an internal vocal sac. A nuptial pad is present on the 1st finger.

Skin smooth or coarsely shagreened with an irregular scattering of conical tubercles. A distinct but narrow dorsolateral glandular fold extends from behind the eye to the region of the vent. Below this fold is a broad chocolate brown band which runs from the tip of the snout through the nostril eye and tympanum and fades on the flanks. Throat speckled and the vent is immaculate.

Colour: Orange above without spots on the back or bars on the limbs; a black band along each side of the head and body; upper lip; canthus rostralis and dorsolateral fold white; terminal discs of toes black, lower parts white.

Distribution: Type collected at Trivandrum, Kerala. Other specimen from Kadnjarkhana, South Kanara, Karnataka.

Breeding: Unknown, except the call. The frog calls from the undergrowth at a height of 15–25 cm from the ground, and the call is syllabified as 'chick-chick-chick'

Habits: Specimens have been collected from a slow stream and in a pool surrounded by undergrowth in a very wet area of rain forest. The descriptions and habits is based on Grandison and Senanayake (1966)¹³

Family: *Rhacophoridae* Hoffman, 1932 (1859)
Tree Frogs

The family Rhacophoridae consists of small to large sized frogs (20–100 mm in snout to vent length) and is primarily of the Oriental region. However, several members of this family have been reported from Madagascar and a single genus *Chiromantis* from Africa. In India, the family Rhacophoridae comprises two subfamilies (*Rhacophorinae*, *Philautinae*) and five genera (*Rhacophorus*, *Polypedates*, *Philautus*, *Chirixalus* and *Theloderma*). The members of the family are arboreal frogs having sticky digital pads; usually inhabit the dense forests of the Western Ghats and the Eastern Himalayas. The genera *Rhacophorus*, *Polypedates* and *Philautus* occur in the Western Ghats area.

Frogs of this family have horizontal pupil; free and deeply notched tongue. In many species of *Rhacophorus* elaborate dermal ornamentations such as flap on fore arm and heel are present. Digit tips are distinctly dilated into discs, with the digital pads having a circum-marginal groove. Webbing of fingers variable but generally extensive. Vocal sacs present. An intercalary ossification between the penultimate and distal phalanges.

KEY TO THE SUB-FAMILIES OF FAMILY RHACOPHORIDAE

Vomerine teeth present (Fig. 4).....*Rhacophorinae*
Vomerine teeth absent.....*Philautinae*

Sub-family: *Rhacophorinae*
Hoffman, 1932 (1859)

Four species grouped under two genera are recorded from Western India.

KEY TO THE GENERA OF RHACOPHORINAE

¹³ GRANDISON, A.G.C. & SENANAYAKE, F.R. (1966): Redescription of *Rana (Hylarana) aurantiaca* Boulenger Amphibia: Ranidae. *The Ann. & mag. of Nat. Hist.* 9: 419-421.

CORRECTION

Key to the genera of Rhacophorinae: read as follows:

KEY TO THE GENERA OF RHACOPHORINAE

Fingers with a slight rudiment of web (Fig. 6)

. *Polypedates*

Fingers with a distinct web (Fig. 6)

. *Rhacophorus*

Dermal fold along the forearm absent..... *Polypedates*

Dermal fold along the forearm present (Fig. 5).... *Rhacophorus*

Genus *Polypedates* Tschudi, 1838

Species of this genus are moderate to very large in size, ranging from 50 to 100 mm in snout-vent length. Skin of body and limbs smooth; in many species skin of skull co-ossified to either fronto-parietal, nasal or squamosal bones. Dermal ornamentations generally absent; digital discs large; usually fingers only webbed at base, nuptial pads always present in males. Vomerine teeth always present.

Polypedates maculatus (Gray, 1834)

Common Tree Frog.

Diagnosis: A slender, medium sized frog. Adults in the *BNHS* collection 50 mm male; 79 mm female in snout-vent length. Vomerine teeth in two more or less oblique series between the internal opening of the nostrils. Skin of head free; a bony arch may be present. Snout obtusely acuminate as long as the diameter of the eye; canthus rostralis distinct; inter orbital width broader than the upper eyelid; tympanum about 3/4 the diameter of the eye; first finger as long as second; fingers with a rudiment of web (Fig. 6a). Toes 3/4 webbed (Fig. 2f). Tips of fingers and toes dilated into discs; discs of the third finger 1/2 or 1/2 the diameter of the eye. Subarticular tubercles well developed. Inner metatarsal tubercle prominent. Tibiotarsal articulation reaches the nostrils. Heels strongly overlap when the legs are folded at right angles to the body. Males with single vocal sac.

Skin smooth above, granulate on the belly and under the thighs a fold from the eye to the shoulder. **Colour:** Brownish, yellowish, greyish or whitish above with darker spots; and hour glass shaped

figure on the back may present; hinder side of thighs with round yellow spots which are usually separated by a dark brown net work. The species has the ability to change its colour to a certain extent to merge with its surroundings.

Distribution: Throughout India except Haryana, Punjab and Rajasthan.

Breeding: The tree frog breeds in the monsoon season. The activities begin just before the onset of monsoon. They select a wide range of breeding sites. Trees hanging over the water tanks or pools, rocks, moist ground and grass clumps are used as spawning sites. The call, generally, is heard after sunset, but they call also during the day after heavy showers. The call can be syllabilised as 'tak-tak --- tak-tak-tak'. This type of note is produced only when the vocal sac is inflated to its full extent. Another call note can be syllabilised as 'dodo-dodo-dodo'. This note is produced when the vocal sac is partially inflated. Individual frogs can call continuously for 15 to 22 seconds.

Amplexus is axillary; the male holds the female at her armpit. The foam-nest is globular in shape with a flat bottom attached to the substrate. The fresh foam is pure white, becoming dirty white or brown on the outer surface with age. The foam-nest measures 65 to 92 mm in diameter. The eggs are pure white and scattered in the foam nest singly and some are exposed on the surface of the mass. The eggs measure *c* 1.25 to 1.5 mm in diameter.

Tadpoles have been collected from rainfed pools, cisterns and ponds. Total length of tadpoles in hind limb stage average 50 mm. Dental formula 1:3+3/3. Beak is moderately black. According to Mohanty-Hejmadi & Dutta (1988)¹⁴, the tadpoles take 55 days for completing the metamorphosis. The tadpoles mainly feed on Desmids, (*Scenedesmus*, *Closterium*, & *Cosmarium*), *Diatoms* and filamentous algae (*Oedogonium*, *Oscillatoria* & *Scytonema*) etc. (Sekar 1986)¹⁵.

Habits: A typical tree frog of moist deciduous forest, which has become semi-urban especially in cities with extensive gardens. Enters houses where it finds the atmosphere of bath rooms congenial. In the suburbs of Madras it has been known to occur in numbers, and bears the common English name of Chunam (= slaked lime used for whitewash) frog from the pale general colouration. The Tamil name is *Therai* and it is believed that if it lands on a child

¹⁴MOHANTY-HEJMADI, P. & DUTTA, S.K. (1988): Life history of the common Indian tree frog, *Polypedates maculatus* (Gray, 1834) Anura: Rhacophoridae) with nine text-figures). *J. Bombay nat. Hist. Soc.* 85: 512-517.

¹⁵SEKAR, A.G. (1986): Ecology of amphibia of Sanjay Gandhi National Park, Borivli, Bombay with special reference to breeding behaviour of adults and food habits of tadpoles. M.Sc. Thesis submitted to University of Bombay.

the legs and hips of the child will become as slender and presumably weak as that of the frogs. Though able to swim well they never live in water and are in fact very uncomfortable when forced to remain in this element. When resting all four legs are drawn up well under the body.

Genus *Rhacophorus* Kuhl and Van Hasselt, 1822

The generic characters are: small to very large rhacophorid frogs (30–100 mm in snout-vent length) with usually rounded snout; body usually slender with narrow waist; skin of head never co-ossified to skull; dermal ornamentations such as flaps on forearm, tarsus, heel, or above anus usually present in most species; digital pad with complete circum-marginal groove. In most species fingers and toes fully webbed. Vomerine teeth usually present. Terminal phalanges Y shaped.

KEY TO THE SPECIES OF THE GENUS *Rhacophorus*

1. Fingers more than half webbed2
1. Fingers less than half webbed (Fig 6b)..... *pleurostictus*
2. Upper surfaces finely granulated; green above.....*malabricus*
2. Upper surfaces with small warts; light reddish brown above.....*calcadensis*

Rhacophorus pleurostictus (Gunther, 1864)

Diagnosis: Medium sized frog. Adult male in the BNHS collection measured 49 mm SV; Female 58 SV. Vomerine teeth present in two small groups; snout rounded; canthus rostralis distinct; loreal region concave; interorbital space as broad as the upper eyelid or a little broader. Tympanum 1/2 the diameter of the eye. Fingers with a very distinct web at the base. First finger less than the second; toes almost fully webbed; tips of fingers and toes dilated into discs with prominent circum-marginal groove; disk of the third finger 1/2 or <1/2 the diameter of eye. Subarticular tubercles moderate. Inner metatarsal tubercle prominent. Tibio-tarsal articulation reaches the eye. Heels overlap when the legs are folded at right angles to the body.

Skin smooth or finely granular; belly and lower surface of thighs granular; a strong fold from the eye to the shoulder.

Colour: Greenish above with large blotches with dark edge; groin and sides of thighs purplish brown with yellowish spots or marbling; limbs with dark cross bands.

Distribution: Nilgiris and Anaimalai Hills.

Breeding & Habits: Unknown.

Rhacophorus malabaricus Jerdon, 1870.
Malabar Gliding Frog.

Diagnosis: Adult male measured 67 mm; female 78.5 mm in BNHS collection. Vomerine teeth in two straight series snout subacuminate; canthus rostralis obtuse; loreal region concave; nostril nearer the end of the snout than the eye; inter orbital width broader than the upper eyelid; tympanum 2/3 the diameter of the eye. Fingers and toes webbed to the discs which is equal the tympanum. Subarticular tubercles well developed. Tibio-tarsal articulation reaches the eye or nostril. Heels overlap when the legs are folded at right angle to the body.

Skin finely granular above; more coarsely beneath; granules under the thighs intermixed with larger ones; outer border of forearm and tarsus with a dermal fold; heel with a triangular dermal process. **Colour:** Green above; often speckled all over with black and white. Lower parts whitish, web between fingers and toes reddish.

Distribution: In Western Ghats from Ponnudi Hills, Kerala to Goa.

Breeding: Breeding coincide with the SW monsoon. A large group of frogs were observed calling in Goa forests all sitting on bamboo shoots. The call can be syllabilised as 'tak-tak-tarrik'. The amplexus was axillary. The male holding the female at her armpit. Foam nests were attached to vegetation some metres above the pool. Tadpoles olive brown in colour closely dotted with dark-brown on the body and lighter on the tail; Length of body 16 mm, length of tail 26 mm. Dental formula is 2: 4 + 4/1 + 1:2. The toes are nearly entirely webbed. The tadpoles are carnivorous. (Ferguson 1904)¹⁶.

¹⁶FERGUSON, H.S. (1904): A list of Travancore Batrachians. *J. Bombay nat. Hist. Soc.* 15: 499-509.



Fig. 1.
a. Tongue with papilla; b. Disc with circum-marginal groove.

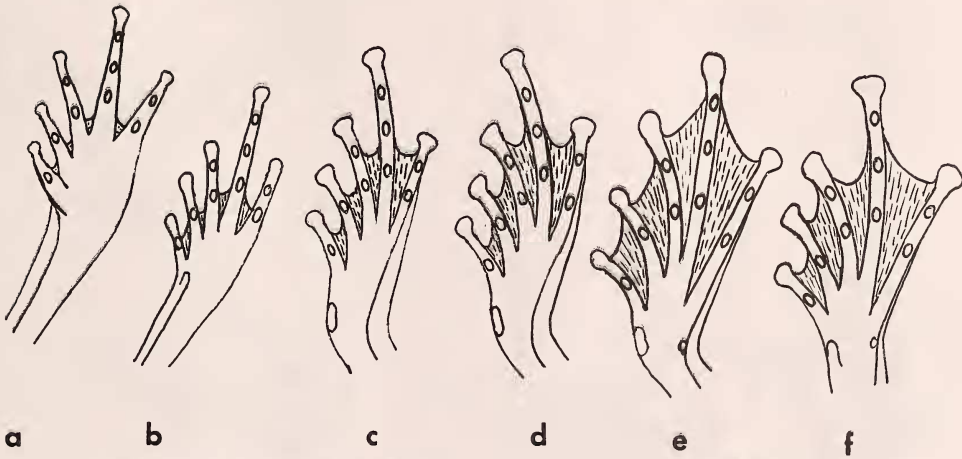


Fig. 2. Degree of toe webbing. a. Rudimentary or $< 1/4$; b. $1/4$; c. $1/2$; d. $2/3$; e. full; f. $3/4$.

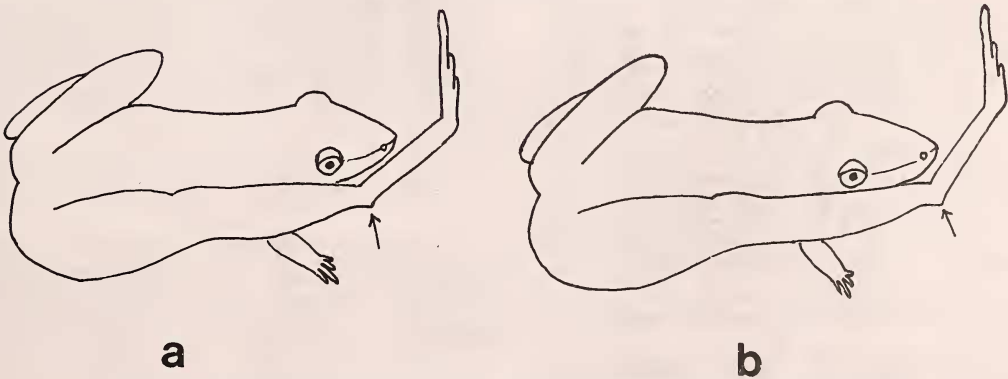


Fig. 3. Tibio-tarsal articulation: a. reaching between eye and nostril; b. reaching tip of snout.

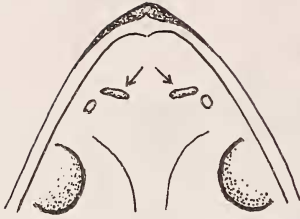
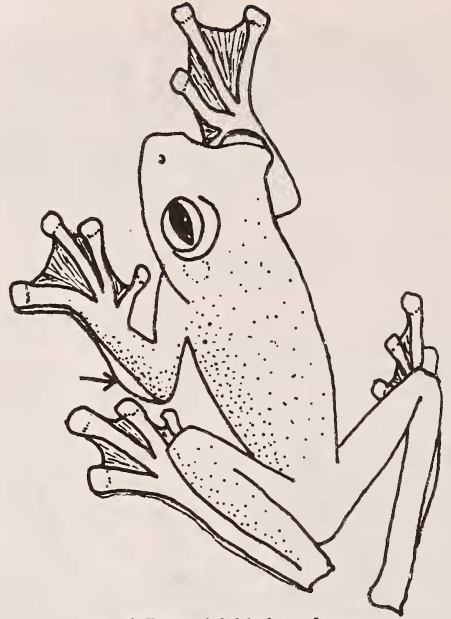
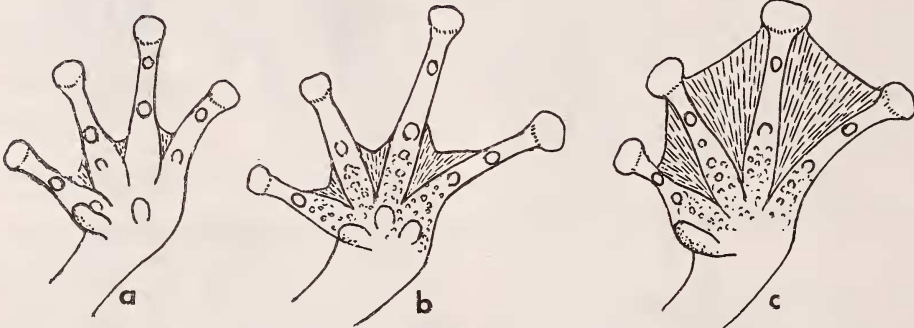


Fig. 4. Vomerine teeth.

Fig. 5. Dermal fold along forearm of *Rhacophorus malabaricus*.Fig. 6. Hand of: a. *Polypedates maculatus*; b. *Rhacophorus pleurostrictus*; c. *Rhacophorus malabaricus*.

Habits: The Malabar Gliding Frogs, occur in evergreen and moist deciduous forests of the Western Ghats. They can glide slantingly from a tree over a distance of 10 m. When jumping/gliding the webs of all four limbs are fully extended. According to Nayar (1931)¹⁷ the frogs naturally likes humid surrounding but does not tolerate water. In captivity during the day the frogs usually rested on the leaves with their legs gathered together and body flattened with the fore-feet folded underneath

their body and pupils contracted to tiny slits. This posture and their leaf green colour rendered them almost invisible among the leaves. The frogs fed on house flies at night in captivity (Abdulali & Sekar 1988)¹⁸.

Rhacophorus calcadensis Ahl, 1927

A medium sized frog measured 50 mm in snout to vent length; Occurs in Kalakaddu forest, Tirunelveli Dist., Tamil Nadu. Not available in the BNHS collection.

¹⁷NAYAR, K.K. (1931): A 'Flying frog' (with a plate). *ibid* 35: 220-225.

¹⁸ABDULALI, H. & SEKAR, A.G. (1988): On a small collection of amphibians from Goa *ibid*.85: 202-205.

(to be continued)